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# **Operationally Responsive Space Launch for Space Situational Awareness Missions**

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The United States Space Situational Awareness capability continues to be a key element in obtaining and maintaining the high ground in space. Space Situational Awareness satellites are critical enablers for integrated air, ground and sea operations, and play an essential role in fighting and winning conflicts. The United States leads the world space community in spacecraft payload systems from the component level into spacecraft, and in the development of constellations of spacecraft. The United States' position is founded upon continued government investment in research and development in space technology [1], which is clearly reflected in the Space Situational Awareness capabilities and the longevity of these missions.

In the area of launch systems that support Space Situational Awareness, despite the recent development of small launch vehicles, the United States launch capability is dominated by an old, unresponsive and relatively expensive set of launchers [1] in the Expandable, Expendable Launch Vehicles (EELV) platforms; Delta IV and Atlas V. The EELV systems require an average of six to eight months from positioning on the launch table until liftoff [3]. Access to space requires maintaining a robust space transportation capability, founded on a rigorous industrial and technology base. The downturn of commercial space launch service use has undermined, for the time being, the ability of industry to recoup its significant investment in current launch systems. This has effectively precluded industry from sustaining a balanced robust industrial and technology base to sufficiently meet all United States Government spacelift needs [2]. The reduction of resources to the Department of Defense and the Air Force, coupled by the long launch preparation periods have further resulted in less operationally responsive spacelift capability from new launch systems.

To assure access to space, the United States directed Air Force Space Command to develop the capability for operationally responsive access to space and use of space to support national security, including the ability to provide critical space capabilities in the event of a failure of launch or on-orbit capabilities. Under the Air Force Policy Directive, the Air Force will establish, organize, employ and sustain space forces necessary to execute the mission and functions assigned including rapid response to the National Command Authorities and the conduct of military operations across the spectrum of conflict [4]. Air Force Space Command executes the majority of spacelift operations for the DoD, and other government and commercial agencies. Air Force Space Command researched and identified a course of action that has maximized operationally responsive space for Low-Earth-Orbit Space Situational Awareness assets.

On 1 Aug 06, Air Force Space Command activated the Space Development & Test Wing (SDTW) to perform development, test and evaluation of Air Force space systems and to execute advanced space deployment and demonstration projects to exploit new concepts and technologies, and rapidly migrate capabilities to the warfighter. The SDTW is organized into two groups and subordinate squadrons, as follows:

- Space Test Group
  - Space Test Squadron
  - Space Test Operations Squadron
  - Launch Test Squadron
- Space Development Group
  - Spacecraft Development Squadron
  - Responsive Satellite Command & Control
  - Responsive Space Squadron
  - Human Spaceflight Payloads Division
  - Mission Design Division

The SDTW charged the Launch Test Squadron (LTS) to develop the operationally responsive spacelift capability for Low-Earth-Orbit Space Situational Awareness assets. The LTS strives to meet shortened operational response periods and on-time suspense criteria for the warfighter, while reducing the life-cycle development, production and launch costs of space launch systems. The LTS created and executed a space enterprise strategy to place small payloads (1000 pounds), at low cost (less than \$28M to \$30M per launch), repeatable and rapidly. The squadron provides scalable launch support services including program management support, engineering support, payload integration and post-test evaluation for space systems.

Based on these criteria, Air Force Space Command determined that LTS would employ retired Minuteman and Peacekeeper ICBM rocket motors as the launch systems for operationally responsive missions, to include Space Situational Awareness missions, to meet the National Space Policy operationally responsive goal [2]. Additionally, LTS would support government research and development space launches and missile defense tests target vehicles. Averaging over eight flight tests per year, LTS has maintained a 98% success rate for LTS managed launches. The squadron's success is founded upon partnerships with commercial spacelift expertise. LTS utilizes task order contract vehicles with commercial space contractors for spacelift missions. In 2006, LTS conducted launch requirements for the NASA TacSat2 mission, employing a Minotaur I space launch vehicle, for a successful launch and mission completion. LTS also successfully launched TacSat3 on 19 May 09.

**CONCLUSION:** The United States' increased Space Situational Awareness in direct support of assuring access to space as a requirement for critical national security, homeland security and civil missions will call for reduced costs in spacecraft and launch vehicles operations. The Air Force, through the SDTW/LTS, will continue to evolve its spacelift execution arm for Space Situational Awareness by creating small, less-expensive, repeatable and operationally responsive space launch capability. In doing so, LTS' shared processes and lessons learned with Air Force, DoD, civil and commercial space entity partnerships will contribute to cost and schedule reductions in launch vehicle and spacecraft development, production and operations.

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